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Science Response 2013/007

EXAMINATION OF MONITORING PROTOCOL TO ASSESS PRIMARY PRODUCTIVITY BASELINE CONDITIONS IN THE ROMAINE RIVER MARINE AND ESTUARINE ENVIRONMENT

Context

In accordance with its undertakings and the conditions listed in the Fisheries and Oceans Canada (DFO) authorization, Hydro-Québec has developed an environmental monitoring program (January 2010) to assess the impact of hydroelectric facilities on the Romaine River. In 2013, the biological and physical oceanography monitoring program comprises physical characterization of the river mouth area in relation to different biological components. An assessment of the baseline conditions of plankton production in the river mouth area of the Romaine River will be carried out.

The Fish Habitat Management Branch (FHMB) undertook an analysis of the detailed monitoring protocol for this component suggested by the proponent. On February 15, 2013, FHMB sought out collaboration from scientists of the Regional Science Branch to issue an advisory report on the monitoring protocol for the marine and estuarine environment of the Romaine River on the North Coast of Quebec. In light of the restricted time frame (deadline is February 22, 2013), a *Science Special Response Process* (SSRP) was initiated to provide a scientific advisory report to FHMB.

This Science Response Report results from the Science Special Response Process of February 22, 2013 on the Monitoring protocol to assess primary productivity baseline conditions in the Romaine River marine and estuarine environment.

Background information

Hydro-Québec provided a report on the design and functioning of an automated buoy to monitor oceanographic variables in the Romaine River area. Hydro-Québec suggested installing two buoys, one near the river mouth and another further offshore in the Mingan Channel. The buoys will continuously measure the following variables:

- Temperature
- Conductivity (salinity)
- Nitrate
- Fluorescence (chlorophyll *a*)
- Dissolved Oxygen
- Dissolved CO_2

All these measures will be carried out with electronic depth sounders. The buoys will be in place from March to August. No monitoring is planned for the fall.

Analysis and Response

The buoy described in the documents is compliant in most respects with DFO requirements for "monitoring mechanisms" indicated in condition 5.1.18 of the Environmental Monitoring Program for the Romaine Complex. However, the criteria stipulate that nutrient salt monitoring will be carried out, whereas the buoy and chemical readings are taken only for nitrate. It is true that nitrate is usually the limiting nutrient matter in coastal waters in the northern Gulf of Saint-Laurence, but silica is also essential to diatom growth, which constitutes the dominant taxonomic group during spring bloom. During a previous consultation for this project, it was emphasized that the nutrient salts are a primary factor to consider when analyzing the potential effect on primary production. Changes in the ratio of nitrate to silica could support or hinder the development of certain species, including harmful species or toxic species (which are generally non-silicate). We expect the future effect to likely be low, considering the river's normal feeds, but the question remains open and the suggested protocol does not address this. To the best of our knowledge, there are no automated depth sounders to measure silica but we recommend adding silica readings to the chemical profiles.

The buoys provide for high frequency sampling, which will be advantageous for data analysis, but only for the surface. To validate the dynamic model developed by Saucier et al. (2003), it would be preferable to do profiles more frequently. Approximately once a month, the level of detail in the water column will be relatively low to compare with a high resolution model. Furthermore, no measurements will be taken beyond the end of August, and although the river flow rate will change minimally in the fall, this part of the year is not covered by the plan. In addition, the model developed by Saucier et al. (2003) simulates the phytoplankton community for two size ranges, a detail that will not be captured in the proposed sampling method.

Conclusions

The sampling plan is expected to provide useful data for monitoring, as well as a partial validation of the model established by Saucier et al. (2003), but the conclusions will be mixed owing to the slight deficiencies noted here.

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Sources of information

Saucier, F.J., Roy, F., Gilbert, D., Pellerin P. and Ritchie, H. 2003. Modelling the formation of water masses and sea ice in the Gulf of St. Lawrence. J. Geophys. Res. 108(C8): 3269–3289.

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